RADIO INTERFACE
PROGRAM FOR THE COMMODORE
C-64 and VIC-20
(REQ. 16K)

☐ DISK ☐ CARTRIDGE

Complete Program on Disk for Sending and Receiving RTTY, MORSE Code and AMTOR for use with your Terminal Unit Modulator/Demodulator

MICROLOG

AIRDISK

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CHAPTER 1
'AIRDISK' PRELIMINARY CHECKOUT

You can check out the "AIRDISK" program without actually having an external T.U. connected. You should probably do this at first just to familiarize yourself with the various commands.

After unpacking your unit, insert "AIRDISK" and load "64" , 8, 1 for the C-64, or load "20", 8, 1 for the VIC-20. Any printers should be 'power off'. Note, the VIC-20 disk version requires a minimum of 16K expanded memory which should be located at block 2 and 3. (Insert cartridge into C-64 or VIC-20 expansion port). For clarity, only the VIC-20 display is shown in the following examples. The "64" display has one long top line with the same information as the two lines of the VIC-20. The words "MICROLOG DISK (CART.)" will appear on the screen for several seconds then the following "TOPLINE" display should appear on the video screen of the VIC-20:

```
R—  B   0 6 0 W P M   N O R              U
                          0 0 : 0 0      U T C
```

This indicates that the system is set to receive (R) RTTY Baudot (B) code at 60 WPM, and that the software RTTY receiver is selected in the Normal (NOR) mode with the "UNSHIFT on SPACE" feature enabled (U). A four digit HH:MM clock which should start advancing is also displayed. With no T.U. connected, the horizontal bar "mark" tuning indicator will appear to the right of the "R" and the reference tone will be on because the program is seeing an open +5V TTL input on the RTTY Rx line.

The "Split Screen" cursor will be displayed in the left center of the VIC screen in blue; white on C-64. The receive text cursor will be at the bottom left VIC screen in black; yellow on C-64. The background color is white on the VIC and light blue on the C-64. If using a monochrome (black and white) T.V./monitor, colors will appear as shades of gray.

In the event that the above does not appear on your video monitor's screen, check the cable between the computer and the T.V. monitor to make sure that it is not shorted or open. You may also have to adjust the T.V. monitor's various controls such as brightness, contrast, etc. Some monitors provide a switch which selects a low or high impedence input. You should select the low impedence (75 OHM) input. Also, if your monitor has a "PICTURE-DATA" switch it should be in the "DATA" position.

CHAPTER 2
'AIRDISK' SYSTEM FAMILIARIZATION

2.1 KEYBOARD:

Your VIC-20 or "64" keyboard has a total of 67 keys including all of the familiar Alpha-Numeric keys. In addition there are special symbol keys, and two keys, namely 'SHIFT' and 'CTRL' which are always used in conjunction with another key. The SHIFT key(s) are located on the bottom row and the CTRL key is located on the left side above the RUN/STOP key.

Note that some of the key tops have two symbols. For example, the 4 and the $ symbols are engraved on the same key top. Much the same as in a standard typewriter you must hold the SHIFT key down while pressing the 4 key in order to type the $ symbol. The CTRL key is used in a similar manner.

In the following description, references are made to various control functions or commands. These commands are executed by simultaneously pressing the CTRL (or SHIFT) key plus one other key. For example, a request to press (or type) 'CTRL X' means that you must hold down the CTRL key, and while holding it down, press the X key, then release both keys. Similarly, to type or press 'SHIFT X' means that you should hold down the SHIFT key, and while holding it press X. As soon as the X key has been pressed you can release both keys.

After familiarizing yourself with the location of the various symbols on the keyboard, type some Alpha-Numeric text. Observe that the characters you have typed are displayed on the upper part of the screen above the split-line. The 'INST/DEL' key which is located on the right side of the top row may be used to correct typing errors. Notice that typing 'INST/DEL' erases the previously typed character.

2.2 VIDEO DISPLAY COMMANDS:

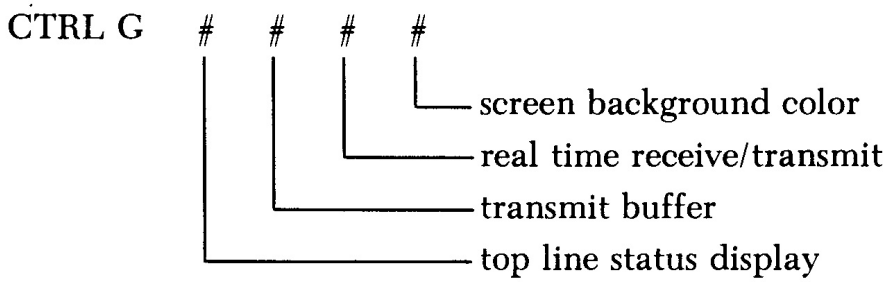
The split-screen option is user selectable. The 'CTRL S' command is used to toggle the split-screen option on and off. To remove the split-screen and use the entire video display for receive text,

TYPE: 'CTRL S' (HOLD 'CTRL' KEY AND PRESS 'S')

In the non split-screen mode, you can still enter text into the buffer, you just can't see it appear before it's transmitted.

2.2.1 ADDITIONAL VIDEO COMMANDS FOR C-64:

The screen and text colors can be changed with a single control command. "CTRL G" followed by a 4 digit number will change the following:



The #'s are the same as the 64's color codes as shown on page 139 of the 64 manual with one exception. To utilize a single digit for all 16 colors, you must enter it in "Hexadecimal" that is 0 through F instead of 0 through 15. The colors are as follows:

0 = Black	8 = Orange
1 = White	9 = Brown
2 = Red	A = Light Red
3 = Cyan	B = Dark Gray
4 = Purple	C = Med Gray
5 = Green	D = Light Green
6 = Blue	E = Light Blue
7 = Yellow	F = Light Gray

The colors will change upon typing the forth digit. Note: The default colors are:

(6) Blue	Top line
(1) White	TX buffer
(7) Yellow	Real time RX/TX
(E) Light Blue	Screen

These colors were picked as the best compromise for both color and monochrome display. You can experiment with different color patterns to suit your individual requirements. Suggestions: 0657, 1AE0, 192A, 569D, 062C.

Note also, the tuning indicators and the RX buffer flags are always displayed in red, except when jumping to AMTOR where they are the same color as the top line.

You can move the entire video display horizontally with the CTRL H command. This should take care of monitors with limited horizontal sync tracking range.

2.3 XMIT/RCV COMMANDS:

Typing 'SHIFT RUN/STOP' or 'SHIFT RETURN' (hold 'SHIFT', press 'RUN/STOP') places the system in the transmit mode. Observe that the top line display has changed and is now displaying:

T B 0 6 0 W P M N O R C H A R

indicating that the system is now in the Transmit Mode (T), the MARK/SPACE frequencies should be NORmal at 2125 and 2295 HZ, respectively (see Chapter 3 for modem connections), and that each character will be transmitted as it is being typed (CHAR). Type some Alpha-Numeric text and observe that the typed text is displayed above the split-line and also below the split line. The text which is displayed below the split-line represents the actual text as it is transmitted. The text which is displayed above the line represents the entries into the system's text buffer.

Return the system to the receive mode with the RUN/STOP key by itself or by typing 'CTRL CLR/HOME' (hold the 'CTRL' key and press the key labled 'CLR/HOME'). Observe that the top line display has changed indicating that the system is in the Receive mode. Type in some text and note that it is no longer displayed below the split line.

2.4 SPEED SELECTION COMMANDS:

NOTE: The right hand bracket] is the symbol for a terminated command which required further keyboard input such as speed select or memory store. When you first initiate these commands, you should not see anything on the screen. If you see the] it means that particular command has been terminated. Hitting 'CTRL X' twice will only terminate the command and it will not take effect.

The operating speed (TTY and MORSE) is selected by means of the 'CTRL X' command. The allowable RTTY BAUDOT speeds are 60, 66, 75, 100, and 132 WPM. ASCII code speeds are 110 and 300 baud. For MORSE, speeds from 5 to 149 WPM are permitted. To select an RTTY (BAUDOT) speed of 66 WPM (SAME AS 50 BAUD), first type 'CTRL B' if not in BAUDOT already, then:

TYPE:	'CTRL X'	(SPEED SELECT COMMAND. NOTHING SHOWS ON SCREEN AT THIS POINT)
TYPE:	66	(DESIRED SPEED)
TYPE:	'CLR/HOME'	(OR ANY NON-NUMERIC KEY. PRINTS] ON SCREEN)

Observe that the top line displays

R B 0 6 6 W P M N O R

To select an RTTY (BAUDOT) speed of 100 WPM (same as 75 baud),

TYPE: 'CTRL X'
TYPE: 100
TYPE: 'CLR/HOME'

Observe the speed display on the top line is now 100 WPM.

To select an RTTY (ASCII) rate of 110 baud,

TYPE: 'CTRL A'

System will automatically go to 110 BAUD when ASCII is selected.

Observe that the top line displays A-110 BD (BAUD) where the 'A' indicates that the selected code is ASCII.

To select an RTTY (ASCII) rate of 300 baud, (no need to type 'CTRL A' since you are already in ASCII)

TYPE: 'CTRL X'
TYPE: 300
TYPE: 'CLR/HOME'

NOTE, if you are in 300 BAUD ASCII, to change to any other speed or code, you must first go to 110 BAUD ASCII. The jump from 300 BAUD ASCII to MORSE or BAUDOT directely is not allowed.

Go back to RTTY (BAUDOT) speed of 60 WPM (Same as 45 baud),

TYPE: 'CTRL B'
TYPE: 'CTRL X'
TYPE: 60
TYPE: 'CLR/HOME'

(ASCII stands for American Standard Code for Information Interchange, whereas 'BAUDOT', pronounced 'BAW DOUGH' is a man's name.)

NOTE, you can omit the 'CLR/HOME' key if you enter the speed with three digits, 110, 066, 075 etc., since the program automatically terminates the command on the third digit.

2.5 MORSE/TTY SELECT COMMANDS:

Enter the MORSE mode by typing 'CTRL M' (hold 'CTRL', press M) and the top display line should read:

R M 0 2 0 W P M N O R

indicating MORSE (CW) mode with speed set for 20 wpm. The system will remember the previous MORSE and RTTY speed when changing to and from modes. Go to the transmit mode by typing 'SHIFT RUN/STOP' and observe that the display has changed and the letter 'T' has replaced the 'R' on the left top display line. Turn up your audio channel volume, and type in some letters and numbers. You will hear the MORSE code as it is displayed below the split-line. To change the speed use the 'CTRL X' command. Also, when the text buffer is empty, if desired, the MORSE equivalent of a "diddle", BT, can be sent. Type 'CTRL D' to toggle the "diddle" mode on/off. To select a MORSE speed of 17 words per minute,

TYPE:	'CTRL X'	
TYPE:	17	(NEW SPEED)
TYPE:	'CLR/HOME'	(OR ANY NON-NUMERIC KEY)

Observe that the newly entered MORSE speed is now displayed on the top line. Any MORSE speed from 5 to 149 WPM may be selected.

NOTE: In the receive mode, the displayed MORSE speed will usually be within plus or minus one digit of the transmit speed you set. As you receive some MORSE characters, the receive speed readout will track the incoming speed, (assuming speedlock is not enabled) but will not change the selected transmit speed.

Return the system to BAUDOT TTY mode by typing 'CTRL B'. The top line should display,

T B 0 6 0 W P M N O R C H A R

2.6 CLOCK COMMANDS:

The AIRDISK includes a real time clock with a 4 digit display of hours and minutes, and a 3 character time zone. When the unit is first turned on the clock is reset to 00:00. You can set the clock to start at any time by means of the 'CTRL K' command. For example, initialize the clock to start at 1758GMT,

TYPE:	'CTRL K'	(CLOCK SET COMMAND—CLOCK DISPLAY WILL FREEZE)
TYPE:	1758GMT	(DESIRED TIME AND ZONE)
TYPE:	'CLR/HOME'	(THIS STARTS THE CLOCK)

The clock will be restarted at 1758GMT as soon as you hit the 'CLR/HOME' key (or any non-numeric key)and the 2nd video line will display:

17:58 GMT

The clock obtains its timing reference from the CPU Crystal frequency and should maintain good accuracy. The clock will have to be reset if power is lost.

The system's clock time can be transmitted by means of the 'CTRL C' command. Type 'CTRL C' and observe that the clock time is displayed on the lower half of the screen as it is being transmitted. If you turn up the reference tone, you can hear the TTY code being transmitted, as you send the time.

2.7 MEMORY STORE/RETRIEVE COMMANDS:

In the AIRDISK VIC-20 version there are 8 message memories of 128 characters each, 2 ID memories of 64 characters each, a WRU memory of 11 characters, and 2 Selective print memories of 11 characters each. You can store messages at any time, even during a transmission. In the "64" version, the first 7 memories contain 512 characters, #8 has 384 characters, other memories are the same as the VIC-20 version.

You can store your call-sign into the ID memory by means of the 'CTRL £' command. For example, to store the call sign W1USA,

TYPE:	'CTRL £'	(HOLD 'CTRL' AND PRESS '£' KEY, NOTHING SHOWS ON SCREEN)
TYPE:	'SPACEBAR'	(PUTS A WORD SPACE)
TYPE:	W1USA	
TYPE:	'CLR/HOME'	(EXITS MESSAGE STORE MODE PRINTS] ON SCREEN)

As you type the call-sign in, it will be displayed above the split-line. You can correct typing errors by means of the 'INST/DEL' key. To retrieve and transmit the stored call-sign simply press the '£' key. The call letters previously stored will be inserted into the text buffer for transmission and displayed above the split-line.

You can store a second call sign by using the CTRL I command. For example, to store the secondary call sign K3ICH/4,

TYPE: 'CTRL I'
TYPE: 'SPACEBAR'
TYPE: K3ICH/4
TYPE: 'CLR/HOME'

The secondary call sign will be transmitted by pressing 'SHIFT £' with a "space" preceding it. You will find it useful to use the secondary ID to store the call of the station you're calling.

To store a message into any one of the 8 available message memories you must first type 'CTRL', and memory number (1 to 8), then enter the message text, and terminate by typing 'CLR/HOME'. For example, to enter: CQ CQ CQ DE N3JL N3JL N3JL into memory number 1,

TYPE: 'CTRL 1' (HOLD 'CTRL', PRESS '1')
TYPE: CQ CQ CQ DE N3JL N3JL N3JL
TYPE: 'CLR/HOME'

To send this stored message, simply press and release the 'F-1' key (right hand function keys). In a similar fashion you can store and retrieve messages from the other 7 memories.

If your message is longer than the selected number of characters it will simply overflow into the next message memory location. For example, if you store a message that overflows into memory 2, it will be properly retrieved in its entirety by typing 'F1'. If you type 'F2', you will retrieve the last remaining characters of the message, which overflowed into 'F2'.

You must use the 'CLR/HOME' key, or any 'CTRL' key to terminate and exit the message store mode. If you do not, you will continue to store characters until you have filled the entire message buffer.

See Section 6 for information on Disk Storage of Memories.

Normally, each of the user programmable memories in the VIC-20 version is 128 characters, which leaves about 2,400 characters for the text buffer. By typing CTRL ' ↑↓ ' (up/down cursor) you can create a receive buffer of 1,000 characters. Typing the same key ' ↑↓ ' by itself will send this new memory. The text buffer is shortened to about 1,400 characters when this additional receive buffer is enabled. See Section 7.2.3.for more information on utilizing this receive buffer and "64" data.

You can also recall and transmit two permanently programmed messages. Pressing 'CTRL' followed by the "Q" key, will recall the "QUICK BROWN FOX . . . " message, and following the "CTRL" by the "R" key, will recall the "RYRYRY . . . " message.

Up to 11 characters may be stored into the WRU (Who Are You) memory. To enter the desired keyword,

TYPE:	'CTRL ='	(HOLD 'CTRL', PRESS ' = ')
TYPE:	XYZ . . .	(UP TO 11 CHARACTERS)
TYPE:	'CLR/HOME'	(PRESS THE 'CLR/HOME' KEY)

The WRU memory functions as follows. Whenever the AIRDISK 'hears' or receives the stored WRU KEYWORD exactly, it will automatically go into the transmit mode and, after a short delay send whatever is stored in the ID memory three times (your call sign), along with the contents of the text buffer and then return to the receive mode. In addition, pin F of the users port will go 'low' for the duration of the transmission.

The two selective print memories can store up to 11 characters each. These are entered exactly as for the WRU memory except that you access these memories by typing 'CTRL 9' and 'CTRL Ø ' respectively.

When the system 'hears' the specific string stored into the "9" memory, the printer port will be enabled, and when it 'hears' the string corresponding to the one stored in "Ø " memory, the printer port will be disabled. Manually typing 'CTRL P' also enables/disables the printer port. Pins D and E will toggle in response also. See Chapter 6 for more info.

To display the current contents of these 3 memories press 'CTRL >' (period key). The contents of the "9" memory are shown next to PON: (printer on), and the contents of the "Ø " memory are shown next to POFF: (printer off).

The " = " memory contains the WRU KEYWORD, shown next to WRU.

You will hear the words, "SEL CAL" (SELECTIVE CALL) and "KEYWORD" used interchangeably on the air.

See Section 7.2 for information on creating 'OFF-THE-AIR' Receive Memory, and for saving the "AUTO-LOAD" memory/system parameter file on disk.

2.8 TRANSMISSION MODE COMMANDS:

The AIRDISK has a number of transmission modes. In the CHARacter mode (this is the system default mode), each character is transmitted as it is typed. In the WORD mode, an entire string of characters is transmitted as soon as the spacebar key is pressed. In the LINE mode the typed characters are transmitted as soon as the 'RETURN' key is pressed.

The system should be in the transmit mode displaying a 'T' on the left top line; if not, type 'SHIFT RUN/STOP'. Enter the WORD mode by typing 'CTRL W' (hold 'CTRL' and press the 'W' key) and note that the status display on the top line indicates that the WORD mode is active.

Now as you type a word, it will be displayed above the split-line. Press the spacebar on the keyboard and notice that the entire word is displayed below the split line as it is being transmitted. Go back to CHAR mode by typing 'CTRL W' again, and note the mode displayed on the screen: CHARacter, WORD, LINE mode.

Now enter the LINE mode by typing 'CTRL L'. Type in some text, and it will be displayed on the upper part of the screen above the split-line. Now press the 'RETURN' key and the text will be transmitted and displayed below the split-line.

NOTE that in the WORD and LINE modes you can edit your text by means of the 'INST/DEL' key since it will not be transmitted until you press the 'SPACEBAR' or 'RETURN' keys respectively. If you are a "hunt and peck" typist, the WORD (or LINE) mode will smooth out your typing and make it sound professional.

Return to CHAR mode by typing 'CTRL W' or 'CTRL L' again. CHAR should then appear if you are in transmit mode.

2.9 TEXT EDITING COMMANDS:

The SPLIT-SCREEN option lets you see what you type, and allows you to correct typing errors before they are transmitted. If you are in the transmit mode, you can enable the WORD or LINE mode as explained above. In the receive mode you can compose and edit larger segments of text. Place the system in the receive mode by typing 'CTRL CLR/HOME'. Type in some Alpha-Numeric text and see it displayed, as you enter it, on the top half of the screen in blue. The characters you are typing are also stored into the system's text buffer memory. When the buffer fills up it inhibits further entry of characters.

You can correct typing mistakes by pressing the 'INST/DEL' key. Pressing this key will cause the previously entered character to be erased and you can correct it. Each press of the 'INST/DEL' key will erase one character. Your edited text can be transmitted by typing 'SHIFT RUN/STOP'. This places the system in the transmit mode, and all characters entered into the text buffer will be displayed below the split line as they are transmitted.

The entire text buffer may be cleared at any time by typing 'CTRL CLR/HOME'. This will also clear the screen and place the system in the receive mode.

You can repeat a segment of text by means of the '←' key. To repeat the transmission of a text segment first type 'SHIFT ←' (press the 'SHIFT' and '←' keys). This serves to point to the beginning of your text. Now enter your text, which will be transmitted if you are in the transmit mode. Press the '←' key and the text will be repeated. Press it again and it will be repeated for the third time. For example, with the system in the receive mode,

TYPE: NAME IS
TYPE: 'SHIFT ←' SPACEBAR
TYPE: JOHN
TYPE: '←' '←' (PRESS '←' 2 TIMES)

This will be entered into the text buffer and will be displayed above the split line as

NAME IS ▞ JOHN ← ←

The "CHECKER BOARD" on the screen is a symbol for the 'SHIFT ←', and the other two symbols represent the repeat function as entered in the text buffer.

Now press 'SHIFT RUN/STOP' or 'SHIFT RETURN' to enter the transmit mode. Observe the text which is displayed below the split-line as it is being transmitted. The word JOHN is sent 3 times, with a space between.

A segment of text may be repeated continuously, until stopped, by means of the 'CTRL ←' command. The procedure is similar to the above example except that you type 'CTRL ←' in place of '←'. For example, to send a continuous CQ message,

TYPE:	'SHIFT ←'	(THIS SETS "BEGIN TEXT POINTER")
TYPE:	'RETURN'	(WILL START NEW LINE)
TYPE:	CQ CQ CQ CQ DE N3JL N3JL N3JL	
TYPE:	'CTRL ←'	

observe the following display above the split line

CQ CQ CQ CQ DE N3JL N3JL N3JL £

The "CHECKER BOARD" is the symbol for 'shift ←.' The reversed left arrow is the symbol for the RETURN (carriage return and line feed) key. The £ is the symbol for the infinite repeat key as entered in the text buffer.

This text will now be transmitted continuously as long as you are in the transmit mode ('SHIFT RUN/STOP'). Transmission will stop as soon as you go to the receive mode ('RUN/STOP') — it will restart if you return to the transmit mode by pressing 'SHIFT RUN/STOP'. You can also stop the continuous repeat function by pressing the 'INST/DEL' key and removing the infinite repeat command from the text buffer. If you type 'CTRL ←' and reinsert this command it will start again.

CHAPTER 3
'AIRDISK' TERMINAL UNIT MODULATOR/DEMODULATOR CONNECTIONS

Any terminal unit modulator/demodulator can be used with the AIRDISK program as long as it meets some simple requirements for connection.

The AIRDISK program utilizes the "user I/O port" on the computer for connection to your T.U. This port is "TTL" compatible, that is it expects to see only 0 to 5 volts, or open/close switch inputs.

Connection to circuits that output **more** than +5 volts **will** damage your computer. Make absolutely sure that your T.U. does not have greater than +5 volts (measured with respect to ground) existing on any of its connections intended to go the Commodore's user port. It should be reassuring to note that most terminal units in use are perfectly acceptable in that their inputs/outputs are just switches, open collector transistor, or relay, which will either not have any output voltage, or are fully "TTL" compatible. Watch out for "current loops" which may have upwards of 100 volts appearing on their outputs!

The "user port" on the Commodore uses a standard 12/24 pin edge card connector with 0.156" center to center spacing. The AIRDISK only requires connection to one side of this card edge, Pins A through N. Do not use a "single side" connector that bridges top and bottom PC fingers! Pins A to N are on the bottom side, and no connection is required to the top side, Pins 1 through 12. See the computer manual for further explanation of the "user port."

You should make up a cable to connect your T.U. to the C-64 user's port using the following diagram.

3.0 USING THE AIRDISK WITH VARIOUS TERMINAL UNITS

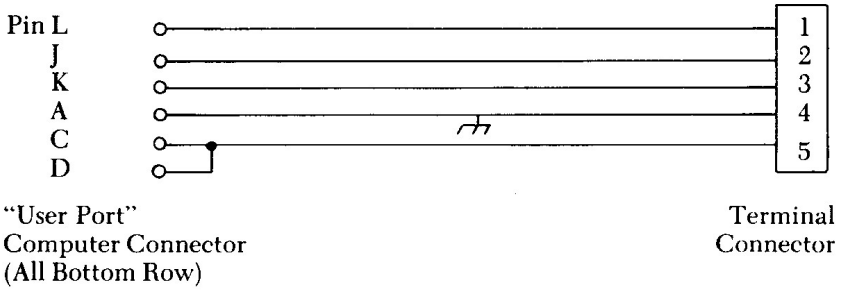
3.1 KANTRONIC'S INTERFACE I, II AND CHALLENGER

Any of Kantronic's interface units can be operated directly with the AIRDISK program. You should make up the connecting cable as shown in Figure 2 for the Interface I & II. Use Figure 3 for Challenger Connections.

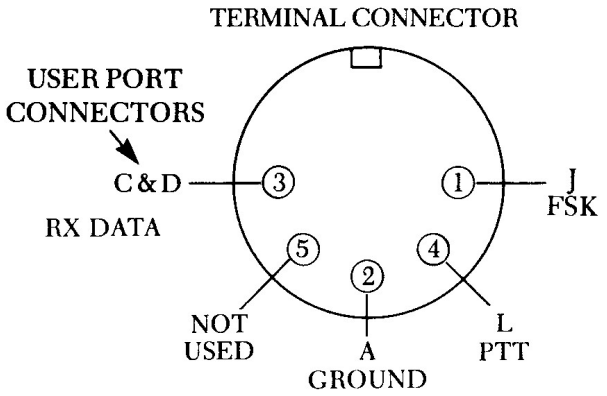
Computer "User Port" Connector (Bottom Side)

GND	FLAG2	PB0	PB1	PB2	PB3	PB4	PB5	PB6	PB7	PA2	GND
A	B	C	D	E	F	H	J	K	L	M	N
GROUND (SHIELD)	NOT USED	RX DATA RTTY FROM T.U.	RX DATA CW FROM T.U.	SELCAL PON OUTPUT	SELCAL POFF OUTPUT	SELCAL WRU OUTPUT + 5V ALL OTHER TIMES	FSK SWITCH OUTPUT	CW KEYING OUTPUT	PTT KEYING OUTPUT	NOT USED	GROUND/(SHIELD)
		TO BE CLOSE CONTACT, 0V OR GND ON SPACE	TO BE CLOSE CONTACT, 0V OR GND ON KEY DOWN	+ 5V ALL OTHER TIMES	0V(GND) FOR 1 SEC UPON RECEIPT OF KEYWORD	0V (GND) DURING WRU REPLY	SPACE = + 5V, MARK = 0V (GND)	KEYUP = + 5V, KEYDOWN = 0V (GND)	RX = + 5V, TX = 0V (GND)		

(Figure 1)



(Figure 2)



(Figure 3)

The AIRDISK should be in the "normal" mode for both receive and transmit. When using the Interface II in the MORSE mode you should have the FM/AM switch in the "AM" (pushed in) position. Due to the abnormally high audio sensitivity (<7 mv) of this interface, the FM or limiting mode will make tuning CW very difficult.

3.2 AEA MICROPATCH, CP-1, etc.

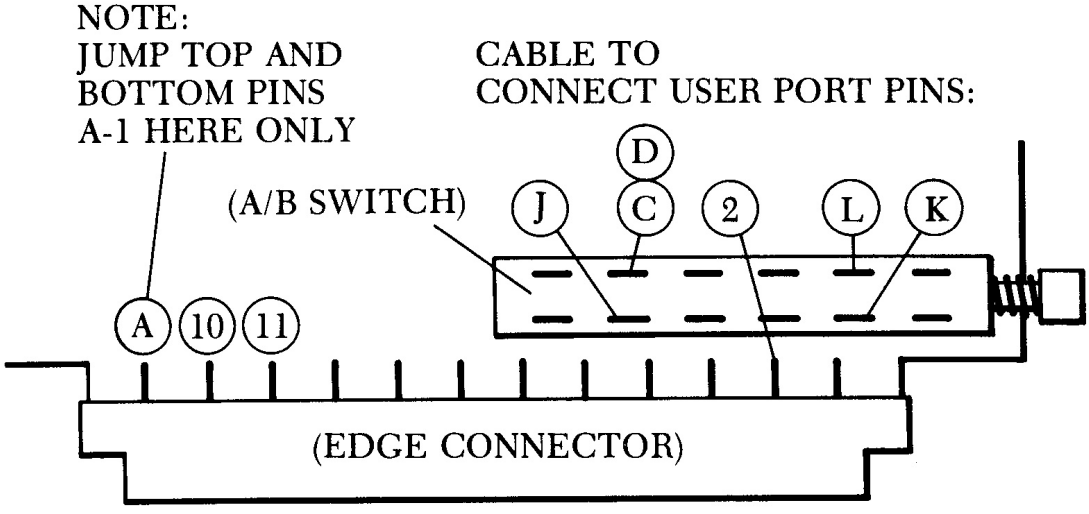
Most of the AEA terminals will work directly connected to the computer. The cable should be wired the same as shown in Figure 2. You will have to invert the transmit logic ('CTRL Minus' in transmit). Receive is "normal." Early CP-1's (R-111 = 1.6k ohm) may require a 47Ω resistor in series with the PTT and key inputs (R-111 on newer units is 18k).

3.3 HAL #CRI-200, CRI-100 TERMINALS

These T.U.s connect the same as shown in Figure 2. The logic is normal in receive and inverted in transmit.

3.4 MFJ-1224 and MFJ-1228

The MFJ-1224 connects the same as the Kantronics 1 and 2 (use figure 2). The MFJ 1228 is designed to plug directly into the user's port. Due to their hard-wired connections to this port, it will not function with the airdisk program when plugged in. You must make a separate cable using the parts supplied with the airdisk. Solder the wires directly to the "A/B Switch" terminals and the edge connector as shown in Fig. 4. All edge connector pins are on the top row of the '1228 except you must jumper pins A to 1 on the '1228 connector. Also, the position of the "A/B Switch" is not important.



(Figure 4)

CHAPTER 4
'AIRDISK' RTTY OPERATION

The AIRDISK program has the ability to receive both amateur and commercial RTTY signals. If you are not familiar with RTTY, it is suggested that, before proceeding further, you read one of the RTTY-PRIMER handbooks.

At the present time the 170HZ shift is in almost exclusive use by amateur RTTY operators. The standard tones for USA amateurs are 2125HZ mark frequency, and 2295HZ space frequency, whereas the European amateur standards are 1275HZ mark and 1445HZ space. Since both utilize 170HZ shift they are fully compatible on HF RTTY. As a matter of fact all tone pairs utilizing 170HZ shift will be compatible on HF RTTY. Set your terminal unit to narrow, 170 Hz shift for use on the hambands.

Selection of inverted RTTY reception can be accomplished by means of the 'CTRL –' (minus) command. 'CTRL +' (plus) selects normal (noninverted) RTTY operation. These commands are valid for receive and transmit, and are operational whether or not your own T.U. has normal/invert functions.

The selected mode is always displayed on the top video line as NOR or INV whenever the system is in the Transmit or Receive mode.

4.1 AMATEUR OPERATION:

Place your transceiver in the RTTY mode (or LSB if RTTY is not available) and tune in an amateur RTTY signal. A good band to try is the 20 meter amateur band between 14080 and 14100 KHZ. Try to locate a relatively strong RTTY signal, and listen to the received audio. Your receiver should be tuned so as to produce the 2125/2295HZ tone pair. Note! you may be using a transceiver which "inverts" the RTTY signal. For example, the ICOM-701, when placed in the RTTY position, will invert the signal, but will not invert it if placed in the LSB mode. If your transceiver "inverts" the signal, place the AIRDISK in the INV mode by typing 'CTRL –' (minus). Transceivers such as the DRAKE TR7, or the KENWOOD TS820 do not invert the received RTTY signal. To insure compatability, we recommend using LSB with the AIRDISK in normal mode.

You can use whatever tuning indicator is provided on your T.U. In addition, the AIRDISK shows an RTTY cross pattern on the top line. When the signal is properly tuned, the on screen tuning indicator will alternate in synchronism with the incoming audio tones. The cross hatch tuning aid simulates the pattern observed when using an oscilloscope for tuning. Proper tuning is in the center when a cross is displayed. The mark displays a horizontal bar and space displays a vertical bar. As a further aid in tuning, the 64/VIC tone synthesizer is used to generate an 800HZ switched reference tone. This tone is available on your television (monitor's) audio channel through the speaker just as various sound effects are heard when using game programs. Simply turn up the volume on the TV to hear the tone. The tone should sound clean and should be synchronized with the tuning indicator mark condition.

Set the system to 60 WPM RTTY operation as this is currently the most popular speed used by amateurs. The mode and operating speed are permanently displayed on the top line of your video screen. To change the operating speed use the 'CTRL X' command to set it directly.

If you are properly tuned, the tuning indicator will alternate between a vertical and horizontal bar at the received bit rate which appears as a cross. If you turn on the reference tone, it should sound clean and be in sync with the received audio.

4.1.1 SELECTABLE OPTIONS:

RTTY reception is further enhanced by means of a number of keyboard selectable options. For a full description of the available RTTY commands see Chapter 7.

You can eliminate the display of most non RTTY signals such as voice or CW by enabling the ANCW (ANTI-CW) option. This option is commanded ON/OFF by means of 'CTRL T' command. When enabled, this ANCW option will inhibit the display of voice and most CW signals. It will also inhibit the display of inverted RTTY signals. There will, however, be a slight delay when you first tune a new RTTY signal before the display is presented on the screen. The letters 'ANCW' will appear on the top line display when in RTTY receive mode.

The actual software (program) operation of the 'ANCW' is to inhibit the video display until 10 properly timed stop bits are received in a row. If two stop bits are missed, the "10" counter is reset and the display is disabled until 10 more stop bits are received in order.

The Unshift On Space function when enabled, will cause an automatic shift to the LTR (lower case) mode upon the receipt of a BAUDOT word space code. In transmit, an extra FIG code will be sent following a space if necessary, so that if the receive station is in "UNSHIFT" mode he will copy properly. This option is useful in that it will not get the system "hung-up" in the FIG (upper case) mode in the event of a failure to detect a BAUDOT LTR (down-shift) code. This option is enabled and disabled by means of the 'CTRL U' toggle action command. When receiving Weather Reports, turn the 'UNSHIFT' option off, as they do not send a FIG shift after each group of numbers. When not in "UNSHIFT" mode, the AIRDISK will react like a mechanical teleprinter in both receive and transmit. When enabled, the letter 'U' will appear near the right side of the top line. It is initially on at power up, and not displayed during transmit.

The reception of a CR (carriage return) code causes the display to start a new line. The system may be inhibited from starting a new line when the CR code is received. The CTRL F command is used to enable and disable the start of a new display line when the CR code is received.

Many printers automatically insert a line feed after receiving a carriage return. By utilizing the CTRL F command, double spacing can be eliminated on these printers.

To transmit, simply type 'SHIFT RUN/STOP' or 'SHIFT RETURN' placing the AIRDISK in the transmit mode. Your transceiver should automatically switch from receive to transmit provided the PTT output on the AIRDISK is connected to your transceiver's send/receive line. Any characters typed on the keyboard will be displayed above the split-line as they are being typed. The text will be displayed on the lower part of the screen as it is being transmitted. If you turn up your monitor's audio volume, you will hear a steady tone (MARK) between characters. This tone, will switch off/on as characters are being transmitted.

You can enable and disable the SYNC (diddle or blank fill) option by typing 'CTRL D'. Enabling this option will cause the system to transmit a non -printing blank code (blank fill) whenever the text buffer is empty and there are no characters to transmit.

You do not have to worry about transmitting LTR or FIG codes in BAUDOT as the system takes care of this automatically. To send LTR code manually type 'SHIFT <', and to send FIG code manually, type 'SHIFT >. The system also takes care of sending an automatic CRLF (carriage return/line feed) after a fixed number of characters in a line. This fixed number of characters (up to 80), is keyboard selectable. The system's default value is 72 characters. To select a value, type 'CTRL <', followed by the desired number, followed by any alpha key. To

eliminate this automatic CRLF feature simply select a value of Ø characters per line. Auto CR/LF is disabled on power up.

In the actual QSO you can take advantage of the split-screen and edit capabilities and thus enter your text while the other station transmits. You will find it convenient to terminate your text typing 'SHIFT ↑', since this will automatically switch you back to receive mode as soon as all of the text preceeding this 'SHIFT ↑' has been transmitted. This command will show in the text buffer as '↑'.

4.2 COMMERCIAL RTTY:

Your AIRDISK and T.U. can be used to copy many commercial RTTY stations transmitting news bulletins and weather data. While the use of a general coverage receiver is most useful, you will find some signals just above the amateur HF bands.

Most of these transmissions will be at 66 WPM (50 baud) with a few, especially weather stations, at 100 WPM (75 baud). These speeds are available to you by means of the 'CTRL X'.

You may also encounter some stations which are utilizing a non Latin alphabet, such as Russian, Arabic, etc. You will of course not be able to decode such transmissions. You should however find numerous stations using the standard Latin character set with transmissions in various languages including English. Commercial stations in general use a wider shift, with 425HZ as the most typical.

NOTE that there are many stations transmitting in other codes such as the 7 level ARQ code copyable in AMTOR listen mode, or an encrypted code which you will not be able to copy.

WEATHER bulletins usually appear in a fixed format. The start of a bulletin is indicated by the 4 letter group ZCZC, and its end by the letter group NNNN. The actual weather information consists mostly of a number of 5 figure groups, interspaced with plain English and abbreviations.

When receiving a Weather bulletin, turn off the unshift on space option in order that you do not shift to letter mode when they send a word space code. If the "UNSHIFT" is on, you will print letter groups instead of figures. You can toggle the "UNSHIFT" option on/off by means of the 'CTRL U' command. If you miss a "FIG" code, you can force the unit to "FIGS" by typing "CTRL Y." This has the same effect as if you received the "FIG" code.

4.3 SYNC LOCK:

Pressing 'CTRL @' will cause the RTTY stop bit to be extended to full character length, thereby slowing the transmission rate to half its normal value. This makes it easier for the receiver to copy especially in ASCII mode since it will help him to re-synchronize much faster. To disable this feature simply re-enter the RTTY speed using the 'CTRL X' command. This feature functions in BAUDOT as well as ASCII, thus enabling a "paced" transmission, slowing the actual data rate to allow for slower typing speeds.

CHAPTER 5
'AIRDISK' CW (MORSE) OPERATION

The AIRDISK is designed to generate perfect MORSE code up to a speed of 149 WPM. The received code will be properly displayed even though not sent by machine. The program will properly decode most hand sent MORSE provided sufficient spacing exists between characters.

The decoding algorithm is designed to continuously measure the average length of both dots and inter-element spaces. The decoding decision logic is such that if an observed space is longer than twice this measured inter-element space it is considered to be a character space. If it is longer than 5 inter-element spaces, it is considered to be a word space. Similarly, an observed mark (key down) is considered to represent a dash if it is longer than twice the measured average dot length.

Since for "perfect" code, a dash = 3 dots, an element space = 1 dot, a character space = 3 dots, and a word space = 7 dots, the above algorithm is very suitable. Furthermore, this algorithm will also decode less than perfect code, and is quite tolerant of extreme dash to dot ratios. The more severe restriction is that for inter-character spacing. In order to decode properly, the inter-character spacing must be at least as long as two times the average element spacing.

5.1 HAND KEY:

Before proceeding with "on the air" reception, you may find it useful and instructive to experiment with a hand key. Connect a hand key in parallel with the "CW RX DATA OUT" from your T.U. Place the system in the MORSE mode by typing 'CTRL M'. Disconnect or turn down the audio from your receiver, and with the unit in the Receive mode, send some V's with the hand-key. If you do not display these V's you must "calibrate". Speed calibration is accomplished by manually telling the system the approximate speed you are asking it to copy. You need not be extremely accurate in your estimation since the AIRDISK allows a ±50% error in actual speed. Also, the "DEFAULT" speed is set to 20 WPM which will be close enough to the typical speeds in common use so as not to need any "recalibration."

Now try sending some code by hand and observe the display. Notice that your sending speed will be displayed on the top line. The displayed speed will change as you speed or slow your sending.

Experimenting in this fashion with hand sent code will assist you in becoming familiar with the MORSE decoding algorithm. You can also listen to your code by turning up the volume on your video monitor's audio channel.

Now enable the SPEED-LOCK feature by typing 'CTRL T'. You should still be able to speed up or slow down within the ± 50 % range and properly display the decoded characters, however the speed display on the top line will no longer be updated. You may still calibrate the system to your fist by pressing 'CTRL X', then the speed. Note that when the SPEED-LOCK is enabled, the word 'LOCK' appears in the status block on the top video line.

Remember that the speed displayed on the top line simply represents the system's internal value of the average dot + element space. For example, consider the case of the perfect code at 20 WPM. Both dot and element space will be equal in length, the actual dot length will be .06 seconds. This is based on the formula,

(speed in WPM) X (dot length in seconds) = 1.2

Thus, when the top line displays a MORSE speed of 20 WPM it means that the system's current value for the so called "average dot" is 60 milliseconds. All incoming code elements (dots, spaces, dashes) are then compared against this current "average dot" value as part of the decoding algorithm's decision process as previously described. This "average dot" is continuously being updated based on the incoming code elements, and the speed display gets updated periodically.

5.2 RECEIVING:

You should now be ready to copy MORSE signals from your receiver. Entering this mode will automatically enable the MORSE tuning indicator. To verify simply observe the topline display. The cross hatch is inhibited and the red dot is used as the tuning indicator. Note that "NOR/INV" also function in MORSE, so be sure you're not trying to copy "inverted" MORSE.

Disconnect the hand key input, and reconnect the audio from your receiver to your T.U. Tune the receiver to a MORSE signal, and place your receiver's AGC in the fast position. As you tune the signal across your receiver's pass band you should be able to hear a regenerated signal if you turn up the audio volume on your video monitor (or television). In the MORSE mode the system should be designed to "hear" an 800HZ note, and the internal reference oscillator is set to this value. If you are properly tuned, the regenerated tone should sound "clean" and the on-screen indicator will flash in unison with it. A key down (mark)

causes the red circle indicator to fill in and the reference tone to be heard. O = key up ● = key down. (C-64 display does not show circle, just blank or dot.)

You will be properly tuned if the audio from your receiver matches, that is, zero beats with the frequency of the internally generated 800HZ (providing your MORSE tone detector is centered on 800HZ). A little bit of experimentation is all that is required to display good copy on the screen. If the receiver volume is too high, which will probably overdrive your CW detector circuit unless an audio limiter is used, the tone will be raspy all the time and the red indicator will flicker constantly even though there's no input signal. Turn down your radio's audio so that with no input signal, the red indicator does not flicker and only an occasional 'beep' is heard from the monitor's audio channel.

Of course, under marginal reception conditions you can expect less than perfect copy even if the code is machine sent. In general it is best if you use a fast AGC in your receiver.

Under noisy conditions you will find it best to use the SPEED-LOCK feature since noise pulses may falsely set the systems's internal "average dot" to value representing a very high speed. Note that even with SPEED-LOCK the system still tolerates reasonable speed variations up to about ± 50%. As you will usually send and receive at the same speeds it is most convenient to simply select the operating speed by means of the CTRL X command, and enable the SPEED-LOCK by typing 'CTRL T'.

You will also find that your receiver's CW filter is helpful in rejecting nearby signals from interfering with the reception of the desired signal. Even if your T.U. includes a sharp audio filter which may be sufficient for rejecting undesirable signals, your receiver's AGC will act in such a way as to reduce its gain due to a strong signal near the desired one. This is a case where a sharp CW filter in your receiver's IF will be very useful. If you do not have one, you may find it desirable under such conditions to completely turn off your receiver AGC, and backoff on the RF gain.

The de-coding algorithms used in the AIRDISK program provide copying ability as good as a machine is capable and are considered the best in the industry. However, you will probably observe that manually sent code, such as by means of a hand key, will not be properly decoded if it is sent "all bunched together" without sufficient intercharacter spacing. It is a common tendency of many CW operators to suddenly speed up and leave insufficient spacing. This is especially true when the call sign is sent. You can improve on the reception of such senders by selecting a slightly higher speed than he is using. For example, if his

average speed is 20 WPM, set the system to a speed of 27 WPM by means of the CTRL X command. Also make sure that the SPEED-LOCK feature is enabled. Use of this technique will enable you to copy the "FAST DOTS" and "SLOW DASHES" typical of semi-automatic key users.

As mentioned previously, if you were using 300 BAUD ASCII, you must first go to 110 BAUD, then to MORSE or BAUDOT. The jump from 300 BAUD to any speed other than 110 BAUD is not allowed.

5.3 TRANSMITTING:

To transmit you simply type 'SHIFT RUN/STOP'. Your transceiver should switch to transmit mode if the PTT from your T.U. is tied to your transceiver's send/receive line. The top display line will indicate that the transmit mode is active ("T" replaces the "R" on the left side of the top line video display) and it will also display the MORSE speed.

If you now type text on the keyboard, it will be displayed on the top half of the screen in blue as each character is typed. The text will also be displayed below in black as each character is sent. You can hear what you are sending by turning up the audio volume on your monitor. At the end of your text type 'SHIFT ↑' in order to automatically return to the Receive mode as soon as all of the previously entered text has been transmitted. ('SHIFT ↑' is displayed as reversed up arrow.)

If you are a slow typist, and you are sending fast code, you may find it useful to use the WORD mode (CTRL W) so as to send your text in bursts of entire words.

With the SYNC = ON, you will automatically send BT (- . . . -) code, whenever the text buffer is empty, and there are no characters to send. This feature is helpful when you want to keep the communication channel active during idle transmission periods. To turn this option off, simply type 'CTRL D' again. Refer to Chapter 7 for listing of commands.

CHAPTER 6
'AIRDISK' PERIPHERAL DEVICES

6.1 PRINTERS:

All VIC/Commodore printers will work acceptably with the AIR-DISK program and connects as it normally would to the appropriate 'DIN' connector on the VIC-20 or 64. There are numerous other printer/printer interfaces that also work. The ON/OFF toggle command for the printer is 'CTRL P' (displays 'P'). If the printer is not connected or unable to accept data, the 'P' will not be displayed and the screen will 'freeze' for a few seconds until the AIRDISK decides not to wait any longer for the printer 'HAND-SHAKE.' Note that the AIR-DISK expects the printer to be "DEVICE NUMBER 4".

When using various Commodore printers, CTRL F3 (function key 3) causes the printer to print oversize letters. CTRL F1 resets to normal letter size.

This output is code and speed converted and any text appearing on the bottom of the screen will be printed.

The AIRDISK also permits you to save one set of programmable memories and ID to be loaded automatically along with the main program. Other sets of memories or receive data can be saved on another formatted disk. First decide what you want to be in your programmable memories and load them normally. To save these as the auto-load memory, go to Basic (CTRL Commodore). Then, with the AIR-DISK in the drive, type:

LOAD "AUTO-LOAD", 8 RETURN

Running this program will save the auto-load memories. Note, this is the only block of memory that can be saved on the AIRDISK. It can, however, be written over if you want to change.

To SAVE/LOAD other groups of programmable memory, you'll have to insert a different formatted disk. Just type 'CTRL Z' while in the normal AIRDISK mode. The screen will ask you to answer "S" or "L" for save or load. Run/stop will abort.

You can also send and receive in real time from the disk by typing the 'CTRL ?' command. You'll then be asked for a filename. The commands that control the RX buffer now control the disk, that is: 'CTRL E' erases, 'CTRL F5' opens 'CTRL F7' closes. The screen symbols are different when operating in real-time from the disk. The diamond ♦ is for closed but enabled, the club ♣ is for open. The real-time disk communicator function must *not* use the actual AIRDISK for storage. You must use a *different* formatted disk to receive and send data to and from the disk. Note also, due to differences in timing and memory available, the real-time disk communicator only runs on the C-64, not on the VIC-20.

For more information on operating in real-time and for basic program transmission/reception, load and run "INFO", 8.

You can display a disk directory by typing 'CTRL ↑'. A normal error channel readout (00 OK 00 00) will display just below the top line on the left. The 'CTRL ↑' command is the same as loading "$", then listing in Basic except that you can stay in the AIRDISK mode.

To "SCRATCH" a file on the disk, type 'CTRL :'. You will then be asked "WHAT FILE NAME?" Type in the file name you want to delete, then 'RETURN'.

CHAPTER 7
'AIRDISK' KEYBOARD COMMANDS

7.1 ALPHA NUMERIC LISTING

KEYS PRESSED	DESCRIPTION
CTRL A	Go to ASCII code RTTY.
CTRL B	Go to BAUDOT code RTTY.
CTRL C	Send clock time. Sends 4 digits plus zone. Time sent is actual time of transmission — not the time of command entry.
CTRL D	Sync (DIDDLE) ON/OFF. When sync is enabled and system is in transmit mode, an RTTY blank code or MORSE BT code will be transmitted if the text buffer is empty.
CTRL E	Delete receive buffer and return transmit buffer to normal size, erase screen, buffer and go to receive.
CTRL F	Ignore received carriage return code. ON/OFF toggle.
CTRL G	64 only — Change screen colors See 2.3
CTRL H	64 only — Horizontal screen shift See 2.3
CTRL I	Enter secondary ID text, of up to 64 characters. Follow the 'CTRL I' by the desired text, and terminate by typing 'CLR/HOME' key. Text will be entered into the text buffer for transmission by typing 'SHIFT £'.
CTRL J	AMTOR only — inverts video display of transmit text
CTRL K	Set clock.
CTRL L	Line mode, ON/OFF toggle.
CTRL M	MORSE mode selection. If system is in RTTY it will switch to MORSE.
CTRL N	Select MORSE det. input for RTTY. (Could be 2nd T.U.)
CTRL O	No action.

KEYS PRESSED	DESCRIPTION
CTRL P	VIC printer enable/disable toggle. Displays 'P' when enabled.
CTRL Q	Send "QUICK BROWN FOX" test message
CTRL R	Send "RYRY"
CTRL S	Split screen toggle On/Off.
CTRL T	MORSE speed-lock On/Off. Top line video displays "LOCK" when enabled in speed-lock mode. If "LOCK" is not displayed when in MORSE receive, the automatic speed tracking is enabled. RTTY-ANTI-CW ON/OFF TOGGLE. This feature if enabled in RTTY mode will inhibit display of non RTTY SIGNAL. Displays 'ANCW' when enabled.
CTRL U	'UNSHIFT ON SPACE' ON/OFF toggle. When selected, the reception of a baudot space code (11011) will cause automatic shift to lower case letters mode.
CTRL V	No action
CTRL W	Word Mode ON/OFF toggle.
CTRL X	Select operating speed. Follow this command by the desired speed in WPM for MORSE or BAUDOT, and in ASCII, by the baud rate.
CTRL Y	Changes current case during reception. FIG to LTR or LTR to FIG.
CTRL Z	Memory save/load on disk.
CTRL 1	Load memory F1
CTRL 2	Load memory F2
CTRL 3	Load memory F3
CTRL 4	Load memory F4
CTRL 5	Load memory F5
CTRL 6	Load memory F6
CTRL 7	Load memory F7
CTRL 8	Load memory F8
CTRL 9	Load printer ON SEL CAL
CTRL Ø	Load printer OFF SEL CAL
CTRL ⇧⇩ (cursor up-down)	Creates receive buffer message. Clear by typing 'CTRL E'.

KEYS PRESSED	DESCRIPTION
CTRL <> (cursor left-right)	Toggle basic communication mode.
CTRL ←	Same as repeat function key "←" except that text will be repeated continuously. To stop type 'CTRL CLR/HOME' which will clear the buffer or type backspace key (INST/DEL) which removes the infinite repeat command.
CTRL + (plus)	IN RECEIVE — Go to "normal" RTTY demodulation (MARK LOW) IN TRANSMIT — Set AFSK to normal mark = 2125HZ space = 2295HZ
CTRL - (minus)	IN RECEIVE — "INVERT" RTTY demodulation (MARK HI) IN TRANSMIT — "INVERT" AFSK, mark = 2295HZ space = 2125HZ
CTRL £	User's ID of up to 64 characters is entered by means of this command. Follow with the text and terminate by pressing the 'CLR/HOME' key. To send the ID the user presses the £ key.
CTRL CLR/HOME	Halt transmission and go to receive mode. Erase text buffer and entire screen.
CTRL INST/DEL	No action.
CTRL @	Enable synclock mode for RTTY transmission
CTRL *	Go to AMTOR.
CTRL ↑	Display disk directory.
CTRL RESTORE	No action.
CTRL:	File scratch (delete).
CTRL =	Load WRU SEL CAL (KEYWORD)
CTRL C = (Commodore key)	Memory/parameter save to disk.
CTRL <	Select number of characters per line. Follow this command by a number representing the number of characters to be transmitted prior to the transmission of an automatic CRLF (Carriage return, line feed) code, which is off at power up. The numeric entry is terminated by typing CLR/HOME. Screen will then display entry bracketed by '&##&.'
CTRL >	Display contents of WRU, print on, print off SEL CALS

KEYS PRESSED	DESCRIPTION
CTRL ?/	Real-time disk communicator.
CTRL F 1	Restores VIC printer to normal size print.
CTRL F 3	Causes large character print on VIC printer.
CTRL F 5	Enables storage into receive memory buffer.
CTRL F 7	Disables (stops) storage into receive memory buffer.
CTRL "SPACEBAR"	The space bar and CTRL keys are pressed to change intercharacter spacing for MORSE code. There are three progressively longer than normal spacings selected with each 'CTRL SPACEBAR' command.
SHIFT ←	Pointer for repeat function. This character enters the text buffer and acts as a "BEGIN REPEAT" text pointer.
SHIFT +	Enter 'BREAK BUFFER' mode which halts text entry into normal buffer and saves current text buffer pointers. Typed text is sent directly when going to 'TRANSMIT' without its being placed in the text buffer.
SHIFT - (minus)	Exit 'BREAK BUFFER' mode. Normal text buffer is undistributed. (Go to receive first, otherwise transmission of normal text buffer will commence.)
SHIFT £	Place secondary ID text into text buffer. NOTE: ID'S CANNOT BE LOADED INTO "F1-F8" MEMORIES DIRECTLY.
SHIFT INST/DEL	No action.
SHIFT @	No action.
SHIFT *	Blank in RTTY.
SHIFT ↑	Disable transmit mode (go to receive) if text buffer is empty. Displayed as an up arrow.
SHIFT RESTORE	No action.
SHIFT RUN/STOP	Enable transmit mode.
SHIFT RETURN	Also enables transmit mode same as shift run/stop.
SHIFT C = (commodore key)	Random code option selected. System will cause 5 character random code groups to be transmitted. Press any key to deactivate.
SHIFT <	Letters code in BAUDOT; < in ASCII.

KEYS PRESSED	DESCRIPTION
SHIFT >	Sends figures code in RTTY BAUDOT; > in ASCII.
SHIFT Ø (zero)	Go to MORSE. Action will occur at that point in text. (DO NOT USE with 300 BAUD operation).
SHIFT A	Sends . - . - in MORSE. (A) European Characters
SHIFT W	Sends . - - . - in MORSE. (A)
SHIFT E	Sends . . - . . in MORSE. (E)
SHIFT O	Sends - - - . in MORSE. (O)
SHIFT U	Sends . . - - in MORSE. (U)
SHIFT N	Sends - - . - - in MORSE. (N)
SHIFT H	Sends - - - - in MORSE. (CH)
SHIFT I	Sends . . - . - in MORSE.
←	Repeat command. All text in buffer is repeated once for each "REPEAT" command, starting at the beginning of the buffer, or from last "SHIFT ←" entry.
+	Sends BK - . . . . - in MORSE:
—	Sends - . . . . - in MORSE: - 'dash' in RTTY.
£	Places contents of ID memory into text buffer for transmission.
CLR/HOME	Used as command terminator.
INST/DEL	Backspace one character and delete it from the text buffer. Action is visible if split screen is enabled. Once text is transmitted, no further editing is permitted.
@	Sends AS . - . . . in MORSE.
*	Sends SK . . . - . - in MORSE. Blank in RTTY.
↑	Sends AR . - . - . in MORSE. Line feed in RTTY.
< > (Cursor)	Sends carriage return in RTTY. (Toggle basic transmit.)
^ v (Cursor)	Places contents of receive buffer into transmit buffer.
RESTORE	No action.
RUN/STOP	Halt transmission and go to receive but does not erase buffer. Re-enable transmit by typing shift RUN/STOP.
=	Sends - . . . -BT in MORSE. = in RTTY.

RETURN	Sends . . . – .VE in MORSE. Carriage Return and Line Feed Codes in RTTY.
COMMODORE KEY	Sends CQ__CQ__CQ__DE__ in all codes.
< ,	Sends comma in all codes.
> .	Sends period in all codes.

7.2 MEMORY STORE/RETRIEVE COMMANDS:

7.2.1 MEMORY STORE:

The 'CTRL 1 to 8' commands are used for entering up to 8 messages into the user programmable memory area plus 3 additional message (11 characters each) are provided for WRU and PRINTER ON/PRINTER OFF SELCAL. User's ID of up to 64 characters, plus a second ID are entered by means of the 'CTRL £' and the 'CTRL I' commands.

To enter the desired text into any of the 8 message memories the user presses the 'CTRL' key, and the memory number (a single digit 1-8) followed by the desired text, terminating with the 'CLR/HOME' key.

To enter the WRU recognition text, the user types 'CTRL =' followed by the text (11 characters or less), terminating with the 'CLR/HOME' key.

To enter the 2 'SELCAL' (selective print) recognition texts, the user types 'CTRL' and one of the numbers 9 or 0, designating the particular SELCAL memory, followed by the recognition text (11 character maximum) and finally ending by typing 'CLR/HOME'.

To enter the ID text, the user types 'CTRL £', then the text (64 character maximum) ending by typing 'CLR/HOME'. To enter the secondary ID text, type 'CTRL I' and proceed as above (64 character maximum). Note that the primary ID can be 128 characters if no secondary ID is used.

To erase previously entered text, simply type 'CLR/HOME' as the first text entry.

7.2.2 MEMORY RETRIEVE:

Any one of the 8 user programmable memories may be retrieved by simply pressing the function keys F1 through F8 representing the memory number.

To retrieve the ID text, press the '£' key. To retrieve the 'Secondary ID' text, press 'SHIFT £'.

7.2.3 AUTO-LOAD MEMORIES

Once you have manually loaded your message memories and set up the system parameters (speed, code, NOR/INV, etc.) you should save them on disk by typing 'CTRLC = ' (Commodore key). Then, with the AIRDISK in the drive, load and run "AUTO-LOAD." This is the "AUTO-LOAD" file which will automatically load along with the normal "AIRDISK" program and should be your primary or main file. Only the "AUTO-LOAD" file is allowed to be saved on the AIRDISK. To save other files (memories, etc.) you must use another disk. Just type 'CTRL Z' while in the normal AIRDISK mode. You will then be asked to name your file. Hit 'RETURN' after typing in the name, (16 characters max), and that file will save to disk. To load these other files, type 'CTRL Z.' You will then be asked to name the file. From here, it's the same as when 'saving.' (Make sure you have properly "formatted" a new disk.)

7.2.4. CREATING THE RECEIVE BUFFER MEMORY:

The AIRDISK program when used with the VIC provides for a 2400 character text buffer. 1000 characters of this can be set aside for a receive buffer that can accept data directly off the air for retransmission. You must first 'create' this new memory by typing 'CTRL ◇ ' (up-down cursor). A large X will be displayed on the top line. The action of this new receive memory is closely tied to the printer and, like the printer, responds automatically to the 'P-ON/P-OFF' SELCALS even if the printer is not on. Manual control is via the commands: 'CTRL F 5' (right hand "function" key number 5) to enable storage and 'CTRL F 7' to stop or disable storage. Flag up 'Γ' will replace the large X when storing receive text. You can enable/disable storage continuously until the 1000 characters are filled. Typing 'CTRL ◇ ' again, erases the previously stored receive text. Note, 'CTRL F 5/F 7' do not control the printer, only receive data storage. To transmit data from this memory, hit the ' ◇ ' key by itself. You can use the 'BREAK-BUFFER' and the 'SHIFT ↑' commands to a great advantage when retransmitting this memory. The 'CTRL E' command returns the text buffer to 2400 characters and disables the receive buffer memory. The normal text buffer in the "64" is 28,000 characters. When the receive buffer is created, the 28K is split so that both the type ahead transmit buffer and the receive buffer memory contain 14,000 character capacity. The same commands apply.

CHAPTER 8
'AIRDISK' SPECS

8.1 INPUT

8.1.1 MORSE — RX CW Data in Pin D of user port. 0V = KEYDOWN, +5V maximum for KEYUP.

8.1.2 BAUDOT, ASCII, AMTOR: — RX RTTY data in Pin C of user port. 0V = SPACE, +5V maximum for MARK.

8.2 OUTPUT

8.2.1 MORSE — TTL level out Pin K of user port. 0V (GND) = KEYDOWN, +5V = KEYUP.

8.2.2 BAUDOT, ASCII, AMTOR — TTL level out Pin J of user port. 0V (GND) = MARK, +5V = SPACE.

8.2.3 TRANSMIT CONTROL (PTT) — TTL level on Pin L on user port. 0V (GND) = Transmit, +5V = Receive.

8.2.4 PRINTER: — Uses standard Commodore printer for hard copy of receive and transmit text. Code converted.

8.3 CODES

8.3.1 MORSE: — International code A-Z, 0-9, comma, period, slash, question mark, parentheses, colon, semicolon, dash, double dash, AR, AS, BT, SK, BK, VE, ERROR, plus 7 special European characters.

8.3.2 BAUDOT: — 5 data bits, 1 start bit, 1.5 stop bits. International alphabet, A-Z, 0-9, LTR, FIG, CR, LF, SPACE, blank, bell, $ - ! : (") # ? & . / ; automatic insertion of LTR/FIG and CRLF (user selectable).

8.3.3 **ASCII:** 110 baud, 11 bit code with one start bit, 8 data bits, 2 stop bits, 300 baud, 10 bit code, one start bit, 8 data bits and 1 stop bit.

8.3.4 **RANDOM:** 5 character random code groups in MORSE, BAUDOT or ASCII.

8.3.5 **AMTOR:** Synchronous 7 unit error detecting, as defined in CCIR 476-2.

8.4 DATA RATES

8.4.1 **MORSE:** 5-149 WPM keyboard selectable in 1 WPM steps. Automatic speed tracking of received code.

8.4.2 **BAUDOT:** All standard baud rates of 45, 50, 57, 74, 100 baud (60, 66, 75, 100, 132 WPM) are keyboard selectable.

8.4.3 **ASCII:** Keyboard selectable, 110, 300 baud.

8.4.4 **AMTOR:** Mode A and Mode B: 50 baud equivalent.

8.5 MEMORY SIZES

		VIC-20	"64"
XMT BUFFER	WO/RX	2,400 CHAR	28,000 CHAR
	W/RX	1400 CHAR	14,000 CHAR
REC BUFFER		1,000 CHAR	14,000 CHAR
PON-POF-WRU		11 CHAR	11 CHAR
ID'S EACH		64 CHAR	64 CHAR
F1–F7 MEM		128 CHAR	512 CHAR
F8 MEM		128 CHAR	384 CHAR

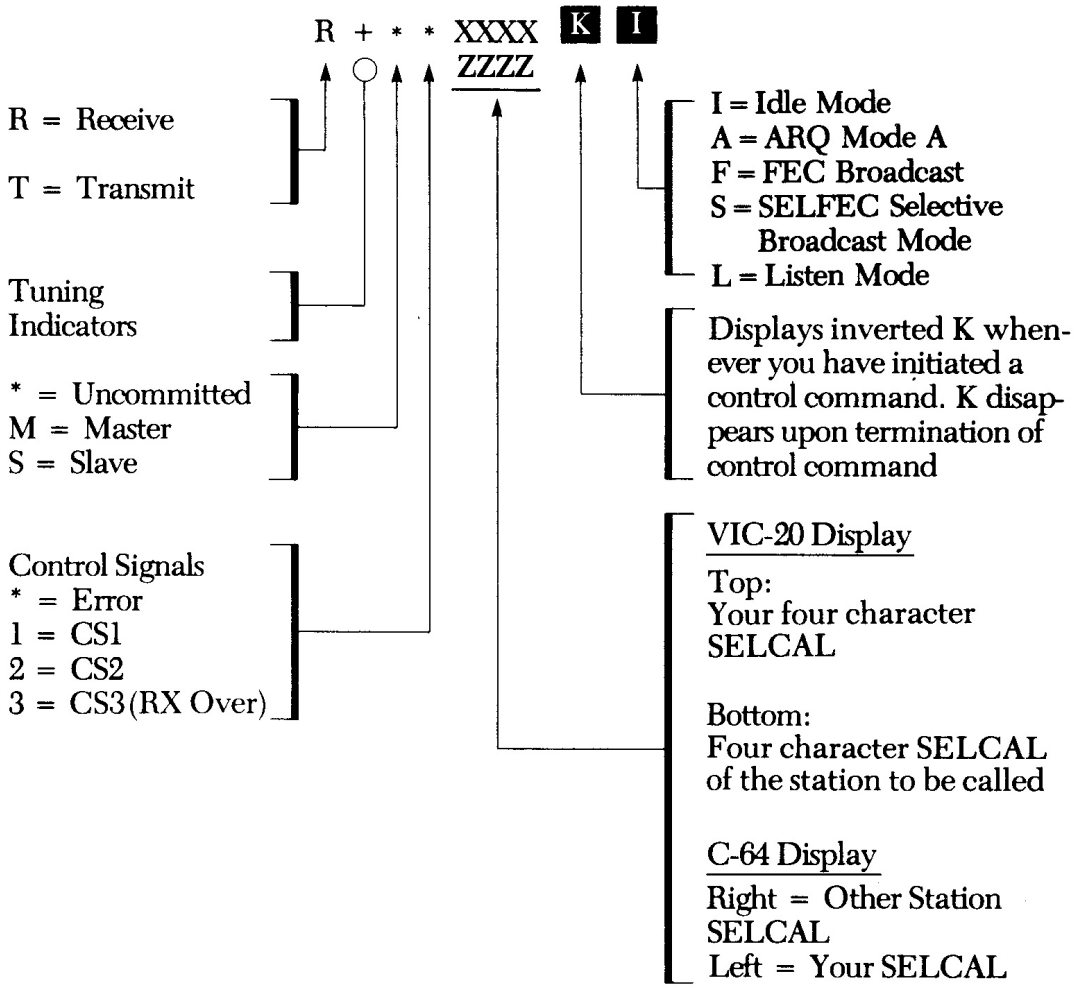
CHAPTER 9 — AMTOR

Definition of Terms used in this manual and in CCIR 476-2

Mode	Definition
AMTOR	AMateur Teleprinting Over Radio. Amateur Radio adaption of ARQ operation
ARQ A	AMTOR (Automatic Repeat reQuest) Mode A, Handshake or Chirp Mode
FEC	Forward Error Correcting — The Non Handshake mode used for general broadcast where data is transmitted in time diversity. (See CBSS).
SELFEC	Selective FEC same as FEC, but data is inverted after initial call block transmission. Used as a "selective" broadcast mode where receiving station automatically inverts copy upon receipt of a predetermined call block. (See SBSS).
STANDBY (IDLE)	Condition where unit will automatically switch to Mode A, FEC or SELFEC upon receipt of proper input. (See Chapter on Operational Differences).
CBSS/CBRS	Collective Broadcast Sending/Receiving Station. Indicates operation in FEC Mode.
SBSS/SBRS	Selective Broadcast Sending/Receiving Station, indicates operation in SELFEC mode.
SELCALS	SELective CALls (See Chapter on Operational Differences)

TOP LINE VIDEO STATUS DISPLAY:

The status line in AMTOR is different from the standard AIRDISK display for RTTY and CW.


R + * * XXXX K I
ZZZZ
R = Receive
T = Transmit
Tuning Indicators
* = Uncommitted
M = Master
S = Slave
Control Signals
* = Error
1 = CS1
2 = CS2
3 = CS3 (RX Over)
I = Idle Mode
A = ARQ Mode A
F = FEC Broadcast
S = SELFEC Selective Broadcast Mode
L = Listen Mode
Displays inverted K whenever you have initiated a control command. K disappears upon termination of control command
VIC-20 Display
Top:
Your four character SELCAL
Bottom:
Four character SELCAL of the station to be called
C-64 Display
Right = Other Station SELCAL
Left = Your SELCAL

OPERATIONAL DIFFERENCES BETWEEN AMTOR AND CONVENTIONAL RTTY

There are some very subtle variations between "on the air" AMTOR and the modes we're used to. Even if you're on RTTY now, this section should be "required reading". Each variance will be discussed by heading.

CALLING CQ:

Since Mode A by definition, is a one on one "handshake" mode, you can only establish contact with a station if *you know his selcal* and, of course, have it loaded into memory. It is easy to check and simple to load. More on this later. It is not recommended to adopt "CQCQ" as our selcal, so that the unit would respond automatically to a patterned CQ. The possibility of half-a-dozen AMTOR stations responding to a

CQ, all chirping back madly might not be too satisfactory. AMTOR Mode A therefore does not lend itself to a general CQ. The broadcast FEC Mode is much more suitable, during which you would include your SELCAL, so that a calling station would **respond** in MODE A. Or, once establishing contact in FEC, and exchanging SELCALS, both stations can then **switch** to Mode A.

SELCALS:

The selcals, short for **SEL**ective **CAL**l, in normal usage means an auto response keyword that the computer recognizes, which tells it to take some pre-determined action. In the realm of AMTOR, the selcals are coded "call blocks" that allow two stations to seek each other out and maintain communication. They are absolutely necessary in order to communicate in Mode A and in the "selective FEC" mode. Each selcal is exactly four alpha characters, no more — no less. The top (2) line(s) display both selcals. Yours is on top (left for C-64), the other station's is below (right for C-64).

They are loaded just like a F1-F8 or ID memory. To load your selcal, first, go to AMTOR by typing 'CTRL *' then type 'CTRL ;' (semicolon), then the four letters of your selcal. The convention at this time is to use all letters with the first and last three of your call. A 1×3 call such as K3ICH would be KICH. A 2×3 call such as WA30YW would be WOYW, likewise, KA4UPH would be KUPH. A 1×2 call, N3JL for instance would double the first letter to become NNJL. Note, these are the currently accepted standards to generate the selcal keywords. These selcals *do not* in any way *replace* your FCC assigned call. They are merely convenient methods to compact one's call into a four-letter block. The MICROLOG unit will accept any four letters into the selcal memories.

In order to call another station in Mode A, you must load his selcal. Do this by typing ' CTRL : ' (colon) then the four letters of his selcal. It is not necessary to follow with the ' CLR / HOME ' key since the unit will only accept the four characters as a valid entry. If you terminate the entry early by hitting the ' CLR / HOME ' key, the existing selcal will be left unchanged.

An easy way to remember which key to use for which SELCAL is by physical placement of the keys. Your SELCAL (the semicolon key) is closest to your ID, the £ key.

IDLE, THE THIRD CONDITION:

A standard, non-AMTOR unit, can be in either of two conditions regardless of the code or speed in use. Either it is in receive or transmit.

The AMTOR mode allows for a third, the Standby or Idle Condition. From Idle, the unit will switch automatically to Mode A (ARQA), FEC (known as CBRS or **C**ollective **B**roadcast **R**eceiver **S**tation) or "SELFEC" (known as SBRS or **S**elective **B**roadcast **R**eceiver **S**tation) if it hears the proper signal activity on its input. During this Idle Mode, the text buffer is locked out, not allowing entry of data. You can load the selcal memories in the Idle Mode, ARQA, FEC or SELFEC. It is necessary however to load the ID and programmable F1-F8 memories before going into AMTOR Mode.

AUTOMATIC-MANUAL ENTRY INTO MODE A

You *manually* enter Mode A from IDLE by typing 'CTRL A', the top line will show the inverted A, plus an M for Master, when you start transmitting. As Master, your unit sets the timing for the communication. Mode A can also be entered automatically from IDLE if the unit is called with the correct selcal. If another station calls you in Mode A by sending your selcal, your unit will automatically switch to Mode A, "phase up" and lock into communication. In this case an S will also show indicating that you are the Slave, and subject to the timing of the other calling unit which is the Master. The Mode A indicator "A" will also be displayed. It will stay locked until one of you terminates by typing CLR / HOME. The only difference between manual and automatic is that in automatic, your unit will return to Idle upon the reception of the "EoC" sequence (**E**nd **o**f **C**ommunications; sent by typing CLR / HOME). In manual, you must manually go back to Idle by typing 'CTRL CLR / HOME'.

Note that no data can be transmitted in Mode A unless you are "phased" with another station and receiving the proper control signals from it. Only the call block data will transmit without being phased up.

PHASING AND TRACKING

As described in the sections on mode A and master/slave, when two stations are *phased* or *timing locked*, there is no automatic frequency control of the radios. Only the timing of each transmission burst is varied. The master sets the *pace* of exactly when in time both transmissions start and stop. The required frequency stability of the radios is exactly the same as when using conventional RTTY. If one drifts too far, the signal will be lost and communication will cease.

The procedure of a "HOT QSY" by changing frequency *while trying to maintain phasing* is to be discouraged. This is sometimes done to move off the calling frequency on an active band, but sliding past a QSO in progress can only be considered discourteous. Technically, it works, but it is obviously quite poor operating practice.

MODE L, LISTEN MODE

You should utilize the LISTEN MODE to copy and identify other stations. This will allow "Eavesdropping" without any interference. Since Mode A is a "one on one" handshake mode, you should not attempt to "break into" a QSO in progress by loading one of the other station's SELCAL, which will cause your unit to try to "Phase-Up". This will severely disrupt the other stations making you an unwanted partner! (A "Roundtable" QSO is theoretically impossible in Mode A.) The copy in the LISTEN MODE might at first appear a bit strange if many repeats are requested, since you will print them all. "THE QUICK BROWN FOX" might print: THE QU QU QUICKICKICKICK BR BR, etc. You can enter the LISTEN MODE by typing 'CTRL L', and terminate by typing the CLR / HOME key. No other functions are permitted while in the LISTEN MODE.

TONE PAIRS:

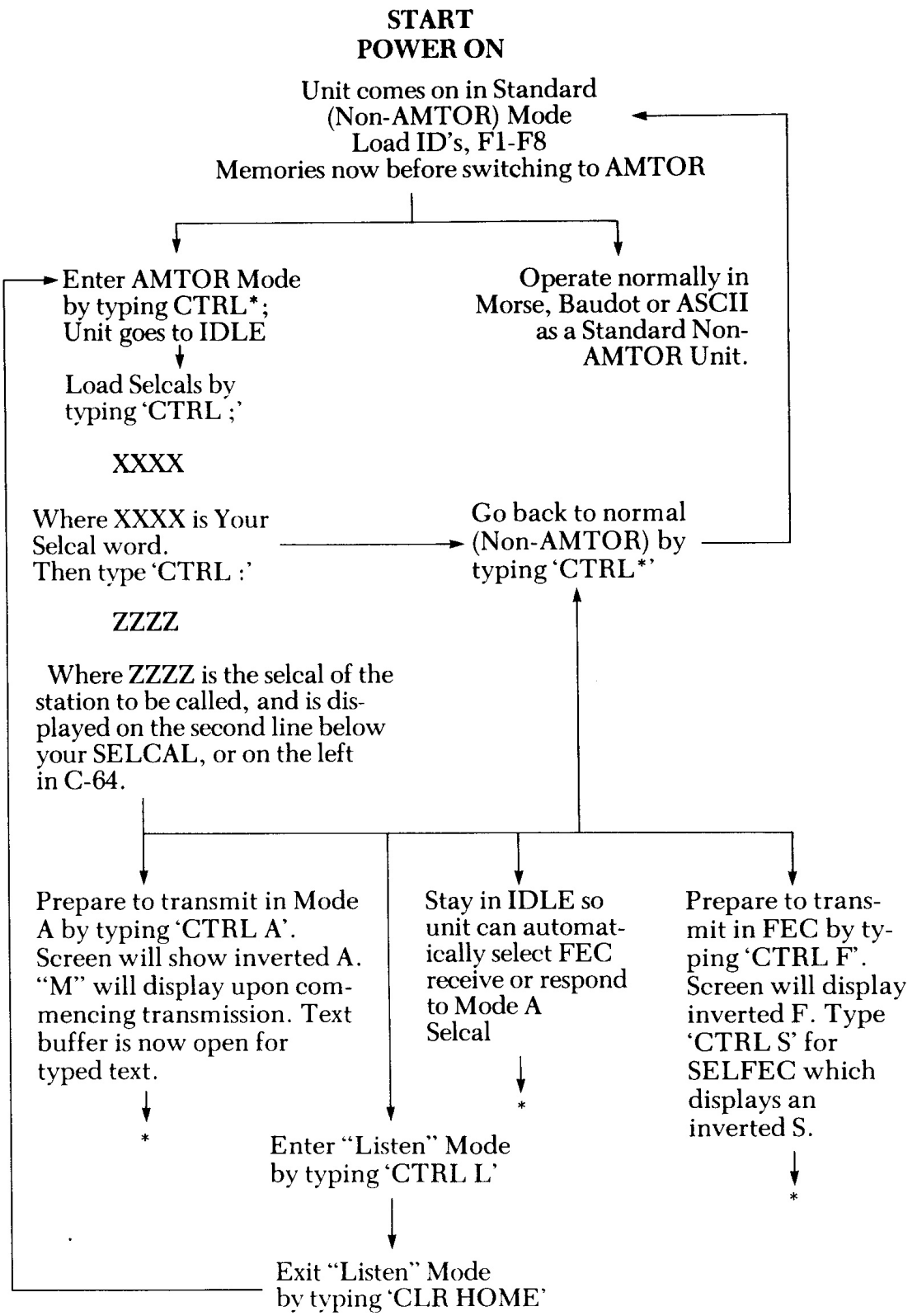
In normal RTTY, the mark is the higher transmitted frequency. This results from using a lower audio frequency and transmitting in lower sideband (Mark = 2125 Hz, Space = 2295 Hz). In AMTOR, or more appropriately, according to CCIR 476-2, these conditions are defined in reverse, so that by transmitting the same tone pair in upper sideband, we are "normal" for AMTOR. Unfortunately, this can be inconvenient when changing modes, since some radios cannot change sidebands readily when they are in an RTTY mode. For this reason, we have included the ability to "invert" the sense of the receive and transmit data, just as you can in normal Baudot or ASCII. You must however, perform this function while in the non AMTOR mode for both receive and transmit. Simply type 'CTRL -', then switch to AMTOR by typing 'CTRL *'. "INV" will replace "NOR" on the top line display. This will allow you to stay in lower sideband without having to retune or alter the passband.

AMTOR Initialization

When power is first applied to the unit it will be initialized to its standard RTTY mode. As a first step the user should initialize the system clock by means of the 'CTRL K' command. Next, load the ID's and F1-8 memories normally, either manually or from Disk/Tape. If you want to stay in LSB for AMTOR, you should type 'CTRL -' to invert the RX and TX data as described in the preceeding chapter. Type 'CTRL *' to switch to AMTOR. To go back to non-AMTOR operation, type 'CTRL *' again. The system status will be displayed on the top line of the video screen.

Enter your 4 character selective call (SELCAL) by pressing 'CTRL ;' (semicolon) followed by 4 letter sequence.

OPERATIONAL FLOW-CHART


START
POWER ON
Unit comes on in Standard (Non-AMTOR) Mode
Load ID's, F1-F8
Memories now before switching to AMTOR
Enter AMTOR Mode by typing CTRL*; Unit goes to IDLE
Load Selcals by typing 'CTRL ;'
XXXX
Where XXXX is Your Selcal word. Then type 'CTRL :'
ZZZZ
Where ZZZZ is the selcal of the station to be called, and is displayed on the second line below your SELCAL, or on the left in C-64.
Operate normally in Morse, Baudot or ASCII as a Standard Non-AMTOR Unit.
Go back to normal (Non-AMTOR) by typing 'CTRL*'
Prepare to transmit in Mode A by typing 'CTRL A'. Screen will show inverted A. "M" will display upon commencing transmission. Text buffer is now open for typed text.
*
Stay in IDLE so unit can automatically select FEC receive or respond to Mode A Selcal
*
Prepare to transmit in FEC by typing 'CTRL F'. Screen will display inverted F. Type 'CTRL S' for SELFEC which displays an inverted S.
*
Enter "Listen" Mode by typing 'CTRL L'
Exit "Listen" Mode by typing 'CLR HOME'

* Exit by typing 'CTRL CLR HOME' to return to IDLE

IDLE

The top line on the video display will indicate that the system is in the IDLE or standby position by displaying an inverted I (IDLE) in the top line display. The selective call (SELCAL) of the station should be entered if not previously done.

The system is now ready to receive data, by automatically switching to ARQ or FEC modes.

ARQ

Automatic Entry:

This mode will be entered automatically (from IDLE) as soon as the selective call of the station is received. The inverted letter A will then replace the I display. The letter S is also displayed to indicate that the station is in the "SLAVE" condition.

Manual Entry:

To initiate communications with a selected station, the user must have previously input the selective call of the station to be called. This is accomplished by pressing the 'CTRL and :' key, followed by the 4 characters representing the desired selective call. Press 'CTRL A' and the inverted letter A will replace the I on the top video line.

Transmission will begin when the normal SHIFT RUN/STOP or SHIFT RETURN is typed. The letter M will appear on the screen to indicate that it is the MASTER or CALLING STATION. Characters entered on the keyboard will be displayed above the split-line on the video screen. They will be displayed below the split-line as they are actually being transmitted. You can have the transmitted text display as inverted video by typing 'CTRL J', which is a "Toggle" command.

During breaks between character entry, non-printing "IDLE BETA" characters are sent automatically. This is similar to the RTTY "DIDDLE" but cannot be turned off since there must be 'something' transmitted to maintain phasing.

MASTER/SLAVE

The system timing, which is the critical synchronism between the two stations in Mode A is set by the MASTER. The SLAVE station adjusts its response timing "clock" to that of the MASTER. Do **NOT** confuse the functions "RECEIVE/TRANSMIT" with "MASTER/SLAVE." They are **NOT** the same. According to CCIR 476-2, the distinction between MASTER and SLAVE is defined by which station

initiates the call in Mode A. The calling station **IS THE MASTER** and stays MASTER throughout the communication until termination. Even if phasing is lost due to propagation, the MASTER will automatically re-call the SLAVE.

CONTROL SIGNALS

Throughout the communication session, the status of various conditions is displayed on video screen. In the process of exchanging control signals between the two stations 1, 2, or 3 which indicate CS1, CS2 or CS3 are displayed. As soon as the two stations are "phased" the control signals will start to toggle between 1 and 2. In the event that a request for signal repetition has been received, the control signal display will freeze until that block is verified. The lower screen display will also stop if that particular 3 character block is not verified. You should only see a "3" as verification of receipt of the over sequence.

The transmitted message will be printed if the printer is on line. Use either 'CTRL V' or 'CTRL P' to enable the proper printer.

AMTOR COMMANDS

Active In			Type:	Action:
I	A	F/S		
			CTRL *	Go to AMTOR (Toggle command, 2nd CTRL * goes to normal RTTY/CW)
•			CTRL A	Enter ARQ Mode A
•			CTRL F	Enter FEC (Collective Broadcast)
•			CTRL S	Enter SELFEC (Selective Broadcast)
•			CTRL L	ARQ Listen Mode
•	•	•	CTRL V	Vic Printer ON/OFF control
•	•	•	CTRL P	Parallel printer on/off control
	•		CTRL Y	FIG/LTR Shift toggle on RCVD ARQ-A

Active In			Type:	Action:
	•		CTRL W	sends who are you request (FIG D)
•	•	•	CTRL J	Display transmitted text in inverted video (Toggle)
	•	•	CTRL CLR HOME	Go to IDLE mode
•	•	•	CTRL ;	Enter 4 CHAR selective call (your unit)
•	•	•	CTRL :	Enter 4 CHAR selective call (his unit)
	•	•	SH-RUN/STOP	Transmit mode
	•		SHIFT ↑	End of message—will "over" on Empty Buffer
	•	•	CRL/HOME	End of Communication
	•		↑(UP ARROW)	Over-reverse ISS/IRS roles
	•	•	F1 to F8	Send contents of a memory F1-8

BREAK (IMMEDIATE "OVER")

Pressing the ↑ key will immediately initiate the "over" sequence "FIG + ?". A detailed description is given in CCIR 3.1.6 of Rec 476-2. This allows the user to exchange roles between ISS/IRS. (Information Sending Station/Information Receiving Stations), and is defined as a control signal, NOT in uppercase. Some programs will improperly shift to uppercase upon receipt of an "over" (PRINT FIGS). If this is reported, just send an uppercase character first to force transmission of a LTR shift.

SHIFT ↑ ("OVER" ON EMPTY BUFFER)

Pressing the SHIFT and ↑ keys simultaneously will cause the over sequence to be initiated as soon as all of the preceding text has been sent.

EoC (End of Communications)

This command is executed by pressing the CLR / HOME key. It causes the "end of communications" signal to be entered into the text buffer. The "end of communications" signal is in accordance with section 3.1.8 of Rec 476-2 to provide an orderly shutdown of both units.

WRU (Who aRe yoU)

When responding to a "Who are you" request, the unit will send the contents of the text buffer, then the contents of the ID memory. (Entered by typing 'CTRL L'.) Load the WRU keyword by typing 'CTRL =' in a non AMTOR mode.

Pressing the 'CTRL W' key while in Mode A communications causes the transmission of request for answerback (FIG D). The other station will automatically respond with his ID, providing his program adheres to the 476-2 spec.

FEC Mode-B Time Diversity

In the Stand-By (IDLE) position the reception of the phasing sequence, as described in 3.2.5 of Rec 476-2 will cause the system to automatically switch to the FEC position. The user may also switch to the FEC position manually by pressing 'CTRL F' on the keyboard. The selected CBRS (**C**ollective **B**roadcast **R**eceiving **S**tation) condition will be displayed as an inverted F on the top video line. Be sure to delete the other stations SELCAL in collective FEC to prevent auto-switching to selective modes type CTRL: CLR/HOME.

When started as CBRS, the system will change to SBRS (**S**elective **B**roadcast **R**eceiving **S**tation) position upon the reception of the characters representing its selective call letters.

The received message will be displayed on the screen, and will be output to the printer if enabled. A * symbol will be displayed at the control signal position of the top line whenever both the direct (DC) and the repeated (RX) characters are in error. The system will revert back to IDLE (Standby) position upon the receipt of **E**nd **o**f **C**ommunications signal, or if the number of received errors is excessive.

During unattended IDLE MODE monitoring, a 30 second software timer will not allow the unit to hang up in FEC MODE which of course, would prevent an automatic shift to Mode A should someone attempt to call.

Loss of phasing during a message will cause the system to automatically re-synchronize. Failure to re-synchronize after an excessive number of errors (or a 30 second lapse of activity) will switch the system to IDLE position. To transmit a message, the user must first enter the FEC (CBRS) position which is accomplished by pressing 'CTRL F' in the IDLE (STBY) position. The desired message(s) are entered directly on the keyboard or retrieved from message memory as previously explained.

To initiate transmission in SELFEC (SBSS), the selective call of the called station must be entered by means of the'CTRL :' command. The called station's selective call will then appear on the display line. This condition will be displayed as an inverted S on the top video line.

Pressing 'SHIFT RUN/STOP' will cause the transmission to be initiated and the system switches to the (FEC or SELFEC) position. The characters will be displayed below the split line as they are being transmitted. They can also be output to the printer. After the last character is transmitted, the 'end of communications' signal will be transmitted if a ' CLR / HOME ' keypress was entered into the text buffer. This will cause the system to revert back to the IDLE (STBY) position.

If a ' CLR / HOME ' keypress was not entered into the text buffers the system remains in the FEC (or SELFEC) positions, and will continuously emit phasing signals in accordance with 3.2.2.1 and 3.2.3.3 of REC-476.

CCIR 476-2

The AMTOR program used in the Microlog AIRDISK is the same protocol as defined by the CCIR 476-2. The only difference involves the actual characters used for the SELCAL blocks. The maritime service typically uses 5 numbers which are condensed into a 4 letter block. AMTOR skips the step and uses 4 letters directly. If you would like a copy of CCIR 476-2 plus any current information, send $5 to Microlog Corporation at the address shown on the manual.

No.	Letter/Figures	International Alphabet No. 2 Code (1)	Emitted 7-Unit Signal (2)
1	A –	ZZAAA	BBBYYYB
2	B ?	ZAAZZ	YBYYBBB
3	C :	AZZZA	BYBBBYY
4	D WRU	ZAAZA	BBYYBYB
5	E 3	ZAAAA	YBBYBYB
6	F !	ZAZZA	BBYBBYY
7	G &	AZAZZ	BYBYBBY
8	H #	AAZAZ	BYYBYBB
9	I 8	AZZAA	BYBBYYB
10	J BELL	ZZAZA	BBBYBYY
11	K (	ZZZZA	YBBBBYY
12	L)	AZAAZ	BYBYYBB
13	M .	AAZZZ	BYYBBBY
14	N ,	AAZZA	BYYBBYB
15	O 9	AAAZZ	BYYYBBB
16	P 0	AZZAZ	BYBBYBY
17	Q 1	ZZZAZ	YBBBYBY
18	R 4	AZAZA	BYBYBYB
19	S '	ZAZAA	BBYBYYB
20	T 5	AAAAZ	YYBYBBB
21	U 7	ZZZAA	YBBBYYB
22	V =	AZZZZ	YYBBBBY
23	W 2	ZZAAZ	BBBYYBY
24	X /	ZAZZZ	YBYBBBY
25	Y 6	ZAZAZ	BBYBYBY
26	Z +	ZAAAZ	BBYYYBB
27	Carriage Return	AAAZA	YYYBBBB
28	Line feed	AZAAA	YYBBYBB
29	Letter shift	ZZZZZ	YBYBBYB
30	Figure shift	ZZAZZ	YBBYBBY
31	Space	AAZAA	YYBBBYB
32	Unperforated tape	AAAAA	YBYBYBB

(1) A represents a start element and Z a stop.

(2) B represents the higher emitted frequency and Y the lower.

Service information signals

Mode A (ARQ)	Emitted Signal	Mode B(FEC)
Control signal 1	BYBYYBB	
Control signal 2	YBYBYBB	
Control signal 3	BYYBBYB	
Idle signal β	BBYYBBY	Idle sign. (sel.)
Idle signal α	BBBBYYY	Phasing signal 1
Signal repetition	YBBYYBB	Phasing signal 2

WARRANTY POLICY

If the AIRDISK ever fails to load properly in you Commodore disk drive, Microlog Corporation will, upon inspection of the disk and verification of the problem, replace the defective disk free of charge.

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